S01020500-IST10131

SECOND TARGET STATION (STS) PROJECT

Interface Sheet for Target Vacuum Controls and Target Vacuum Systems

Mike Strong
Dana Humphreys

April 2025

OAK RIDGE NATIONAL LABORATORY
MANAGED BY UT-BATTELLE FOR THE US DEPARTMENT OF ENERGY

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Approvals

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Target Vacuum Systems Lead Engineer	Mike Strong					
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Target Systems Manager	Peter Rosenblad					
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00	Initial Release

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1. PURPOSE

This document defines the interface between Target Vacuum Systems (S.03.11) and Target Vacuum Controls (S.06.03.11). The interface described in this document will provide inputs to the design of Target Vacuum Systems and Target Controls Systems. Requirements derived from this document are included in the Target Vacuum Requirement Document and Target Controls Requirement Document.

2. SCOPE

The scope of this document is the complete interface definition for the interface between Target Vacuum Systems and Target Controls Systems as identified in the parent Interface Control Document for Integrated Control Systems and Target Systems S01020500-IC0009.

No.	Components (Target Vacuum)		Components (Target Vacuum Controls)	
	Name	Functional reference Number	Name	Functional reference Number
1	Target Vacuum field instrumentation		Target Vacuum field instrumentation control hardware, software, and wiring	

3. ACRONYMS AND DEFINITIONS

CMS Cryogenic Moderator Systems
CV Core Vessel
I&C Instrumentation and Controls for Integrated Control Systems
ICD Interface Control Document
IS Interface Sheet
P&IDs Piping and Instrumentation Diagrams
PBW Proton Beam Window
PCD Process Control Description
PLC Programmable Logic Controller
SSC Structure, System or Component
WBS Work Breakdown Structure

4. REFERENCES

4.1 DOCUMENTS APPLICABLE TO THE INTERFACING SSCS

Ref	Document Titles	Document Control System Location
[1]	Interface Control Document for Integrated Control Systems and Target Systems	S01020500-IC0009
[2]	Integrated Control Systems Requirement Document	S06000000-SR000002
[3]	Target Controls Requirement Document	S06030000-SR0001
[4]	Target Vacuum Requirement Document	S03110000-SR0001
[5]	Proton Beam Window P&ID	S03090200-J8U-8800-A10007
[6]	Core Vessel Atmosphere Management P&ID	S03090200-J8U-8800-A10009
[7]	Activated Component Drying P&ID	S03090200-J8U-8800-A10017
[8]	Cryogenic Moderator System P&ID	LATER

5. INTERFACE DEFINITION

5.1 TECHNICAL DESCRIPTION OF THE INTERFACE

Vacuum systems are required in various Target Systems to create and maintain the necessary environment for efficient system operation. The scope of Target Vacuum Systems (WBS S.03.11) includes the following:

- Proton Beam Window and Proton Beam Window Shielding Inflatable Seal Vacuum
- Core Vessel Atmosphere Management
- Activated Component Drying Vacuum
- CMS Hydrogen Coldbox and Transfer Line Vacuum

5.1.1 Interface No. 1: Target Vacuum field instrumentation--- Target Vacuum field instrumentation control hardware, software, and wiring

Target Vacuum Systems (S.03.11)

- Responsible for design, procurement, and installation of Target Vacuum field instrumentation

Target Vacuum Controls (S.06.03.11)

- Responsible for the software and programming for monitoring and control of the Target Vacuum field instrumentation
- Responsible for design and implementation of EPICS operator screens for Target Vacuum field instrumentation
- Responsible for the design, procurement, and installation of the PLC cabinet and associated auxiliary cabinet hardware for Target Vacuum Controls
- Responsible for the design, procurement, and installation of cable and conduit from Target Vacuum Controls PLC to the field instrumentation

Anything outside the noted criteria of this document requires review by Target Vacuum Controls and Target Vacuum Systems.

5.1.2 Design Responsibility

5.1.2.1 Piping and Instrumentation Diagrams (P&IDs)

Target Process Systems (S.03.09) is responsible for designing and drafting the P&IDs for the Target Vacuum Systems. Target Vacuum will provide input on field instrumentation and Target Vacuum Controls will provide input for the integrated controls shown on the P&IDs.

5.1.2.2 Process Control Description (PCD)

Target Process Systems (S.03.09) will provide a PCD, with input from Target Vacuum Systems, describing the proper functionality and control for Target Vacuum Systems, including Machine Protection System (MPS) interlocks and process control interlocks.

Target Process Systems (S.03.09) will also provide a Setpoint and Alarm List, with input from Target Vacuum Systems, showing process control setpoints and alarm limits for Target Vacuum Systems instrumentation.

5.1.2.3 Software

The PCD, and Setpoint and Alarm List, described in Section 5.1.2.2, will serve as design input to the Target Vacuum Controls software which will provide monitoring and control of the Target Vacuum Systems. This includes PLC logic for field instrumentation, EPICS configuration, operator interface screens, process data monitoring, and alarm handling.

5.1.2.4 Field instrumentation and Final Control Element Selection

Target Vacuum Controls will provide technical expertise on selection of field instrumentation using process conditions provided by Target Vacuum Systems. Target Vacuum Systems will be responsible for the final selection and purchase of the instrumentation, calibration certificates, and manufacturer drawings. Target Vacuum Systems and Target Vacuum Controls will work to together to ensure all devices are compatible with the STS standard PLCs. Target Vacuum Controls will prepare Instrument Datasheets to document the instrumentation selected.

5.1.2.5 Installation Diagrams

Target Vacuum Systems will provide installation drawings showing instrument locations and installations. Target Vacuum Controls will assist in the installation drawing design.

5.1.2.6 Wiring of Field instrumentation

Target Vacuum Controls is responsible for providing documentation for instrumentation cable terminations at the field instrumentation, terminal boxes, and the PLC enclosure. Target Vacuum Controls will also provide fabrication drawings and wiring drawings for the related PLC cabinet assembly.

5.1.3 Procurement

Target Vacuum Systems is responsible for procurement of field instrumentation. All field instrumentation should be purchased with calibration certificates and manufacturer drawings.

Target Vacuum Controls is responsible for the procurement of control system hardware, including the PLC cabinet assemblies, junction boxes and/or cable connectors, and cable/conduit between the PLC cabinet and field instrumentation. They will also procure any software packages required for control and monitoring of the Target Vacuum Systems.

The financial responsibility for the components is summarized in the following table:

WBS S.03.11 Target Vacuum Systems	WBS S.06.03 Target Vacuum Controls
Field instrumentation	PLC cabinet
	Control software & associated computing
	Cabling from PLC to field instrumentation
	Patch panels and/or junction boxes
	Cable connectors

5.1.4 System Installation

Target Vacuum Systems will be responsible for installing all field instrumentation.

Target Vacuum Controls will be responsible for installing the PLC cabinet, intermediate junction boxes and/or cable connectors, and cable/conduit between the PLC cabinet and field instrumentation. They will also be responsible for configuration of field instrumentation, as required.

5.1.5 System Testing

Prior to Target Vacuum Systems Integration Testing, Target Vacuum Controls will provide ICS checkout procedures/testing which include the following:

- Verifying wiring is installed correctly
- Verifying the instrumentation is performing as required
- Testing control algorithms to the extent possible without endangering equipment
- Verification of signal from field instrumentation to EPICS

Target Vacuum Systems will provide overall System Integrated Testing which includes sequence of operation, start-up, and commissioning procedures. Target Vacuum Controls will support this testing.

5.1.6 Summary of Design Responsibility

Table 1 below summarizes design documentation responsibility of Target Vacuum Systems and Target Vacuum Controls:

Summary of Design Documentation Responsibility		
Target Vacuum Systems (S.03.11)	Target Process Systems (S.03.09)	Target Vacuum Controls (S.06.03.11)
Field instrumentation procurement documentation (S.06.03.11 will provide input)	P&ID (S.03.11 and S.06.03.11 will provide input)	Software Specification for PLC, EPICS, etc.
Installation diagrams (S.06.03.11 will provide input)	PCD & Setpoint list (S.03.11 will provide input)	Instrument datasheets (S.03.11 will provide process conditions)
System integration test plan (S.06.03.11 will provide input)		Wiring diagrams for instrumentation (end to end)
		Fabrication drawings for PLC cabinet assembly
		ICS checkout test plan

Excluded from this table is responsibility for design of conduit routing between the PLC cabinets and field instrumentation, which will be resolved after Preliminary Design phase.

5.2 INTERFACE DATA

The block diagram shown in Figure 1 of Appendix A, illustrates the Target Vacuum Controls architecture. Detail design data for specific interfacing hardware such as cable connections for instrumentation and final control elements will be documented in wiring diagrams.

6. APPENDIX A

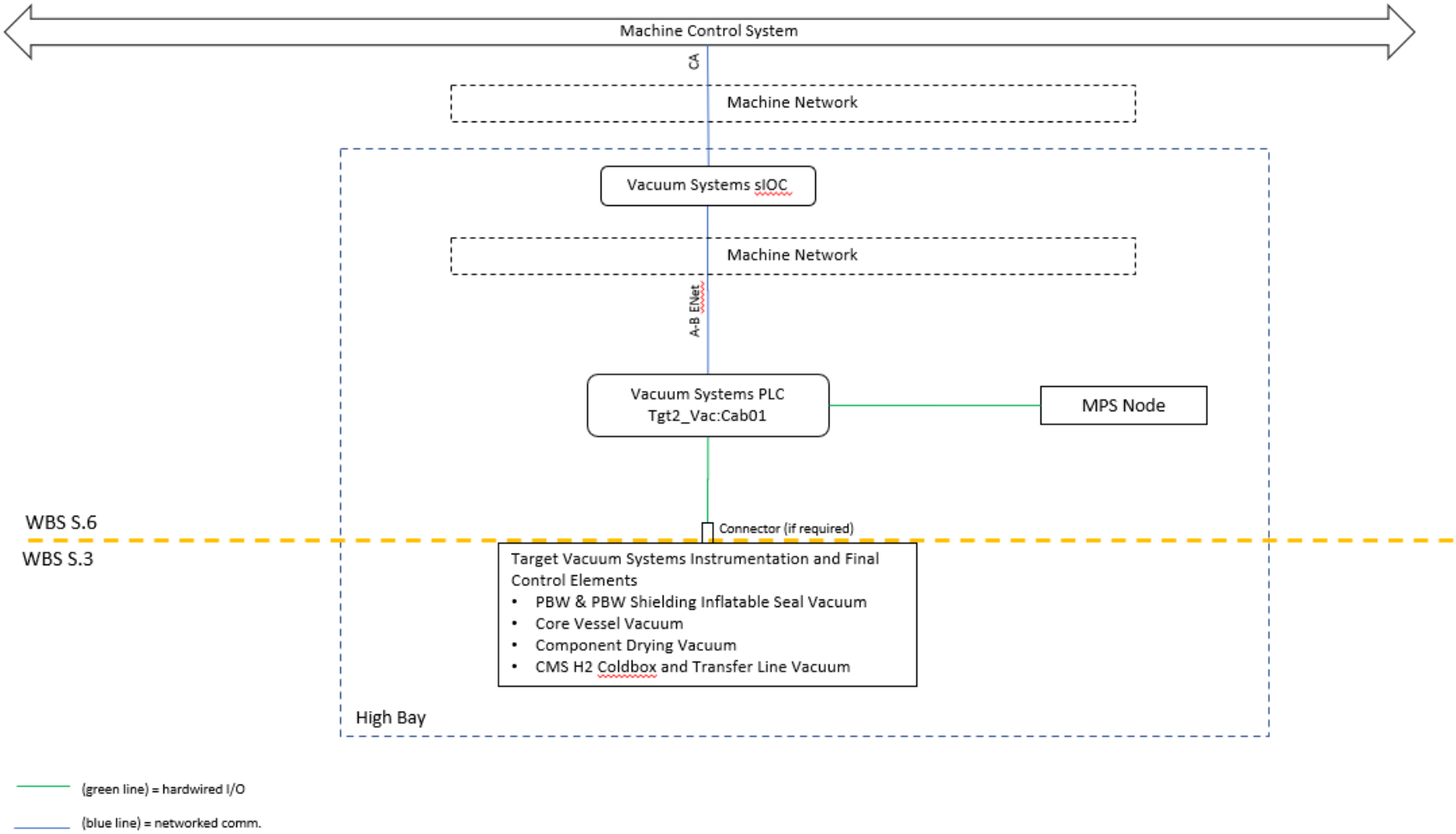

Figure 1: Target Vacuum Controls Architecture